REMARKS

Reconsideration of this application, as amended, is respectfully requested.

THE CLAIMS

Claim 1 has been amended to clarify the feature of the present invention whereby the at least one second electrode comprises a transparent conductive film, as supported by the disclosure in the specification at, for example, page 12, lines 13-16, as well as to clarify the feature of the present invention whereby the at least one reflective film is positioned between the second electrode and the internal surface of the back substrate, as supported by the disclosure in the specification at page 12, line 27 to page 13, line 2.

In addition, claim 17 has been amended in a similar manner to clarify the feature of the present invention whereby each of the plurality of pixel electrodes comprises a transparent conductive film, and whereby the plurality of reflective films are positioned between the plurality of pixel electrodes and the internal surface of the back substrate.

Still further, claim 4 has been amended to correct a minor clerical error.

No new matter has been added, and it is respectfully submitted that the amendments to the claims are clarifying in

nature. Accordingly, it is respectfully requested that the amendments to the claims be approved and entered under 37 CFR 1.116.

THE PRIOR ART REJECTION

Claims 1, 3, 8, 10, 11, 17 and 18 were rejected under 35 USC 103 as being obvious in view of the combination of US 2002/0063824 (newly cited "Ha et al") and US 2003/0063244 (previously cited "Fujimori et al"); and claims 7 and 13-16 were rejected under 35 USC 103 as being obvious in view of the combination of Ha et al and Fujimori et al with one or more of US 2002/0041351 (previously cited "Baek"), US 2003/0160914 (newly cited "Ha"), US 2004/0004681 (previously cited "Ozawa et al") and US 2002/0154257 (previously cited "Iijima"). These rejections, however, are respectfully traversed with respect to the claims as amended hereinabove.

According to the present invention as recited in amended claim 1, a liquid crystal display device is provided having a liquid crystal element which comprises at least one thin film transistor (TFT) arranged on the internal surface of a back substrate, and wherein at least one pixel is defined in a region in which a first electrode and a second electrode, which comprises a transparent conductive film, are opposed and which does not overlap the TFT. As recited in amended claim 1, at least one reflective film is positioned between the second

electrode and the internal surface of the back substrate so as to correspond to a part of the region in which the at least one pixel is formed that does not overlap with the region where the thin film transistor is formed. Thus, a reflective portion and a transmissive portion are defined for the at least one pixel. In addition, a color filter, which has an opening at a position corresponding to a part of the reflective portion, is provided to correspond to the pixel, and a liquid crystal layer thickness adjusting layer is provided in at least a region corresponding to the reflective portion between the front substrate and the back substrate, in order to set a thickness of the liquid crystal layer in the reflective portion to be thinner than a thickness of the liquid crystal layer in the transmissive portion.

Similarly, according to the present invention as recited in amended independent claim 17, a liquid crystal element is provided which comprises an opposite electrode on an inner surface of a front substrate and a plurality of TFT's on an internal surface of a back substrate. As recited in amended independent claim 17, a plurality of pixels are formed in respective regions where a plurality of pixel electrodes oppose the opposite electrode, and each of the pixel electrodes comprises a transparent conductive film. In addition, as recited in amended independent claim 17, a plurality of reflective films are positioned between the plurality of pixel electrodes and the

internal surface of the back substrate, so as to respectively correspond to parts of regions in which the plurality of pixels are formed. Thus, reflective portions and transmissive portions are defined for the pixels. As recited in independent claim 17, moreover, a color filter is provided to correspond to the plurality of pixels, and liquid crystal layer thickness adjusting layers are provided in regions corresponding to at least the reflective portions on the color filter, in order to set a thickness of the liquid crystal layer in the reflective portions to be thinner than a thickness of the liquid crystal layer in the transmissive portions.

Thus, according to the present invention as recited in each of amended independent claims 1 and 17, the second (or pixel) electrode is made of a transparent conductive film, and the reflective film is arranged on the internal surface of the back substrate, between the internal surface and the second (or pixel) electrode. With this structure, no metal film (other than an aligning film) exists on the second electrode or the pixel electrode comprising the transparent conductive film. Therefore, the electric field to be applied between the first electrode and the second electrode (or opposite electrode and pixel electrode) is substantially uniform among the respective pixels. As a result, it is harder for disorder to occur in the orientation of

the liquid crystal molecules when the electric field is applied, and a more uniform display can be achieved.

Ha at al discloses a transflectlve liquid crystal display including two opposing substrates, wherein a thin film transistor is formed on the substrate 210; a first passivation layer 260 is formed on the thin film transistor; a transparent electrode 270 is formed on the layer 260 and is connected to a drain electrode 252 of the TFT; and a reflective electrode 290 is formed on the transparent electrode 270 via a second passivation layer 280. According to Ha et al, the reflective electrode 290 has a second transmissive hole 291 for exposing the electrode 270, and, as pointed out by the Examiner, Ha et al discloses that this device can be applied to a color display device comprising a color filter.

It is respectfully submitted, however, that Ha et al clearly does not disclose teach or suggest a reflective film provided between the internal surface of the back substrate and the second (or pixel) electrode, which is formed of a transparent conductive film, and, as according to the present invention as recited in amended independent claims 1 and 17.

In addition, as recognized by the Examiner, Ha et al does not disclose the structure of the color filter of the present invention as recited in claim 1. For this reason, the Examiner

has cited Fujimori et al to supply the missing teachings of Ha et al.

Fig. 16 of Fujimori et al shows a liquid crystal display device in which transparent insulative substrates 40 and 10 are arranged opposite to each other. A TFT 30 is formed on the internal surface of the back transparent insulative substrate 10, an insulating film 18 covers the TFT 30, a transparent electrode 22 formed on the insulating film 18, and a reflection electrode 24 is formed on the transparent electrode 22 to define a reflection region of the electrode 20. In addition, as recognized by the Examiner, a color filter layer 42 having openings 42' is formed on the internal surface of the substrate 40, and first and second transparent dielectric layers 44a1' and 44a2' are formed opposite to the reflection electrode 24 on the color filter. And, as recognixed by the Examiner, the liquid crystal layer 50 in Fig. 16 of Fujimori et al is thinner in an area corresponding to the reflection electrode 24.

However, it is respectfully submitted that, like Ha et al, Fujimori et al does not disclose that a reflective film is provided between an internal surface of the back substrate and the second (or pixel) electrode, which is made of a transparent film, as according to the claimed present invention.

In addition, with the structure of Ha et al, in the transparent region a voltage applied to the transparent electrode 270 is applied to the liquid crystal layer via the second passivation layer 280, while in the reflective region a voltage is applied to the liquid crystal layer from the transparent electrode 270 via the reflective electrode 290.

And with the structure of Fujimori et al, the reflection electrode 24 is connected to the transparent electrode 22 in the reflective region, which causes a decrease in the voltage due to the contact resistance between the transparent conductive film constituting the transparent electrode 22 and the metal film constituting the reflection electrode 24. Moreover, a potential difference may be caused among the pixels due to the difference in surface resistance between the transparent conductive film and the metal film.

Therefore, with the structures of Ha et al and Fujimori et al (in which the reflective film is arranged more closely than the transparent conductive film to the liquid crystal layer) unevenness may be caused in intensity of electric field to be applied to the liquid crystal layer from the respective pixels, which makes it difficult to align the liquid crystal molecules in the liquid crystal layer homogeneously, and thereby produces display unevenness.

By contrast, with the structure of the claimed present invention, the reflective film is provided between the internal surface of the back substrate and the second (pixel) electrode, which comprises a transparent conductive film. With this structure, the surface of the transparent conductive film faces the liquid crystal layer with no other conductive film intervening therebetween, and the transparent conductive film is the only element that functions as an electrode. Therefore, an electric field can be to the liquid crystal layer uniformly by the pixels, thereby enabling a stable alignment of the liquid crystal molecules an a uniform display.

Baek, moreover, has merely been cited for the disclosure of a homogeneous liquid crystal and of upper and lower retardation plates with orthogonal slow axes, and of upper and lower polarizing plates with orthogonal transmission axes.

In addition, Ozawa et al has merely been cited for the disclosure of setting the phase difference of the transmissive display regions T and reflective display regions R of the liquid crystal display element to 1/2 wavelength and 1/4 wavelength respectively.

Still further, Ha has merely been cited for the disclosure of a reflective surface with depressions and protrusions.

And finally, Iijima has merely been cited for the disclosure of a scattering reflective plate.

It is respectfully submitted that none of Ozawa et al discloses, teaches or suggests a reflective film that is provided between the internal surface of the back substrate and the second (pixel) electrode, which comprises a transparent conductive film, as according to the present invention as recited in amended independent claims 1 and 17.

In view of the foregoing, it is respectfully submitted that amended independent claims 1 and 17, and claims 2-8 and 10-16 depending from claim 1, all clearly patentably distinguish over Iijima, Fujimori et al, Baek and Ozawa et al, taken singly or in any combination consistent with the respective fair teachings thereof, under 35 USC 102 as well as under 35 USC 103.

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Entry of this Amendment, allowance of the claims and the passing of this application to issue are respectfully solicited.

RE: THE WITHDRAWN CLAIMS

It is respectfully requested that withdrawn claims 2, 4-6 and 12 also be considered on the merits and allowed, upon allowance of their parent claim 1.

If the Examiner has any comments, questions, objections or recommendations, the Examiner is invited to telephone the undersigned for prompt action.

Respectfully submitted,

/Douglas Holtz/

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